We claim:

1. An exciter assembly for a vibratory roller, comprising:

(A) an exciter housing;

(B) an exciter shaft rotatably journaled in said exciter housing;

(C) a fixed eccentric weight rotationally fixed to said exciter shaft;

(D) a free swinging eccentric weight mounted on said exciter shaft so as to rotate with respect to said exciter shaft between 1) a first angular position in which the eccentricity of said free swinging weight adds to the eccentricity of said fixed weight and 2) a second angular position in which the eccentricity of said free swinging weight detracts from the eccentricity of said fixed weight, wherein said free swinging weight is mounted on said exciter shaft so as to be restrained from substantial axial movement along said exciter shaft without the use of any retaining structure that is fixed to said free swinging weight.

2. The exciter assembly as recited in claim 1, wherein said free swinging weight is sandwiched between a first end of said fixed weight and a component comprising one of a torque transfer element and a bearing and is restrained from substantial axial movement along said exciter shaft solely by said first end of said fixed weight and said component.

3. The exciter assembly as recited in claim 2, wherein said free swinging weight is a first free swinging weight, and further comprising a second free swinging eccentric weight mounted on said exciter shaft so as to rotate with respect to said exciter shaft

~~between 1) a first angular position in which the eccentricity of said second free swinging~~ weight adds to the eccentricity of said fixed weight and 2) a second angular position in which the eccentricity of said second free swinging weight detracts from the eccentricity of said fixed weight, wherein said second free swinging weight is located axially between a second end of said fixed weight and another component comprising the other of said torque transfer element and said bearing and is restrained from substantial axial movement along said exciter shaft by said second end of said fixed weight and said another component, respectively.

4. The exciter assembly as recited in claim 1, wherein said free swinging weight has a tab that extends over an adjacent axial end of said fixed weight and that engages a first side of said fixed weight when said free swinging weight is in said first angular position and that engages a second side of said fixed weight when said free swinging weight is in said second angular position.

5. The exciter assembly as recited in claim 1, wherein said fixed weight is formed ~~integrally with said exciter shaft.~~

~~3~~ 6. The exciter assembly as recited in claim 1, further comprising a motor having a rotary output shaft which is coupled to said exciter shaft and which is co-axial with said exciter shaft.

17. The vibratory roller as recited in claim 14, wherein said roller is a vibratory trench roller, and wherein said motor output shaft is splined directly to said exciter shaft.

18. The vibratory roller as recited in claim 14, wherein said fixed weight is formed integrally with said exciter shaft.

19. The vibratory roller as recited in claim 14, wherein said exciter housing is formed integrally with said axle housing.

20. A method of assembling an exciter assembly for a compaction machine comprising:

(A) fixing a torque transfer element and at least two bearings to an exciter shaft;

(B) fixing an eccentric weight to said exciter shaft;

(C) mounting first and second free swinging eccentric weights on said exciter shaft adjacent respective ends of said fixed weight so as to be rotatable a limited amount relative to said exciter shaft;

(D) restraining said first and second free swinging weights from substantial axial movement along said exciter shaft solely by sandwiching said first and second free swinging weights between respective ends of said fixed weight and operative components of said exciter assembly, each of said operative components comprising one of a bearing and a torque transfer element.

23. The method as recited in claim 20, further comprising coupling an output shaft of a motor to said exciter shaft such that said motor output shaft extends coaxially with said exciter shaft.

Sub A7

24. The method as recited in claim 20, wherein all of the fixing steps are performed without the use of any hardware.

Sub B4

25. The method as recited in claim 24, wherein at least some of the fixing steps comprise pressing the associated components onto said exciter shaft.

Sub A8

26. The method as recited in claim 24, wherein the step of fixing said fixed weight to said exciter shaft comprises forming said fixed weight integrally with said exciter shaft.

27. A method comprising:

(A) assembling an exciter assembly by

(1) fixing a torque transfer element and at least two bearings to an exciter shaft without using any hardware,

(2) fixing an eccentric weight to said exciter shaft without using any hardware,

(3) mounting first and second free swinging eccentric weights on said exciter shaft adjacent respective ends of said fixed weight so as to be rotatable a limited amount relative to said exciter shaft, and

restraining said third free weight from substantial axial movement along said second exciter shaft solely by sandwiching said third free weight between said second fixed weight and one of said bearings,

restraining said fourth free weight from substantial axial movement along said second exciter shaft solely by sandwiching said fourth free weight between said second fixed weight and said second torque transfer element, and

inserting said second exciter assembly axially into an opening in said exciter housing and mounting said second exciter assembly in said exciter housing.

29. The method as recited in claim 27, further comprising coupling an output shaft of a motor to said exciter shaft such that said motor output shaft extends coaxially with said exciter shaft.

30. The method as recited in claim 27, wherein the inserting step comprises inserting the exciter assembly into an exciter housing that is formed integrally with an axle housing of said roller.

Sub A5

7. The exciter assembly as recited in claim 6, wherein said motor output shaft is splined directly to said exciter shaft.

8. The exciter assembly a recited in claim 1, further comprising

a drum which surrounds said exciter housing, which is rotationally supported on a surface to be compacted, and which is excited to vibrate by said eccentric weights.

9. The exciter assembly as recited in claim 1, wherein said exciter shaft and said fixed weight comprise a first exciter shaft and a first fixed eccentric weight, respectively, and further comprising

a second exciter shaft rotatably journaled in said housing,

a second fixed eccentric weight rotationally fixed to said second exciter shaft,

a free swinging eccentric weight mounted on said second exciter shaft so as to rotate with respect to said second exciter shaft between 1) a first angular position in which the eccentricity of said free swinging weight adds to the eccentricity of said second fixed weight and 2) a second angular position in which the eccentricity of said free swinging weight detracts from the eccentricity of said second fixed weight, wherein said free swinging weight is mounted on said second exciter shaft so as to be restrained from substantial axial movement along said second exciter shaft without the use of any retaining structure that is fixed to said free swinging weight.

Sub A5

10. ~~The exciter assembly as recited in claim 9~~, further comprising

a drive element which is mounted on said first eccentric shaft such that said free swinging weight on said first exciter shaft is restrained from substantial axial movement along said first exciter shaft solely by said first fixed weight and by said drive element, and

a driven element which is mounted on said second eccentric shaft such that said free swinging weight on said second exciter shaft is restrained from substantial axial movement along said second exciter shaft solely by said second fixed weight and by said driven element, and wherein said drive element is coupled to said driven element so as to transfer drive torque thereto.

11. The exciter assembly as recited in claim 10, further comprising

a first bearing which supports said first exciter shaft on said exciter housing;

a free swinging eccentric weight mounted on said first exciter shaft between said first fixed weight and said first bearing and which is restrained from substantial axial movement along said first exciter shaft solely by said first fixed weight and said first bearing, respectively;

a second bearing which supports said second exciter shaft on said exciter housing; and

a free swinging eccentric weight mounted on said second exciter shaft between said second fixed weight and said second bearing and which is restrained from substantial axial movement along said second exciter shaft solely by said second fixed weight and said second bearing, respectively.

12. An exciter assembly that is configured to impart vibrations to a rotating drum assembly of a vibratory roller, comprising:

(A) an exciter housing which is formed integrally with an axle housing of the rotating drum assembly;

(B) an exciter shaft which is rotatably journaled in said exciter housing by at least two bearings;

(C) a fixed eccentric weight which is rotationally fixed to said exciter shaft;

(D) a first free swinging eccentric weight which is sandwiched between a first end of said fixed weight and one of said bearings and which is restrained from substantial axial movement along said exciter shaft solely by said fixed weight and said one bearing;

(E) a second free swinging eccentric weight 1) which is sandwiched between a first end of said fixed weight and a component consisting of a) another of said bearings and b) a torque transfer element fixed to said exciter shaft and 2) which is restrained from substantial axial movement along said exciter shaft solely by said fixed weight and said component.

13. The exciter assembly as recited in claim 12, wherein said exciter shaft is a first exciter shaft, said fixed eccentric weight is a first fixed weight, and said second free weight is sandwiched between said first eccentric weight and a first torque transfer element fixedly mounted on said first exciter shaft, and further comprising

a second exciter shaft which is rotatably journaled in said exciter housing by at least two bearings;

a second torque transfer element which is fixedly mounted on said second exciter shaft and operatively coupled to said first torque transfer element;

a second fixed eccentric weight which is rotationally fixed to said second exciter shaft;

a third free swinging eccentric weight which is sandwiched between a first end of said second fixed weight and one of said bearings on said second exciter shaft and which is restrained from substantial axial movement along said exciter shaft solely by said first fixed weight and said one bearing; and

a fourth free swinging eccentric weight which is sandwiched between a second end of said second fixed weight and said second torque transfer element and which is restrained from substantial axial movement along said exciter shaft solely by said second fixed weight and said second torque transfer element.

14. A vibratory roller comprising:

(A) a chassis;

(B) at least one drum assembly supporting said chassis on a surface to be compacted, said drum assembly being hollow and having a length corresponding to the width of strip to be compacted, said drum assembly comprising an axle housing and a drum rotatably supported on said axle housing via an axle; and

(C) an exciter assembly which imparts vibrations to said drum and which is fully contained within said drum, said exciter assembly comprising:

(1) an exciter housing located within said axle housing,

(2) an exciter shaft rotatably journaled in said exciter housing by at

least first and second bearings,

(3) a fixed eccentric weight rotationally fixed to said exciter shaft,

(4) first and second free swinging eccentric weights, each of which is mounted on said exciter shaft so as to rotate with respect to said exciter shaft between 1) a first angular position in which the eccentricity of said free swinging weights add to the eccentricity of said fixed weight and 2) a second angular position in which the eccentricity of said free swinging weights detract from the eccentricity of said fixed weight, and

(5) a motor having a rotary output shaft which is coupled to said exciter shaft and which is co-axial with said exciter shaft.

15. The vibratory roller as recited in claim 14, wherein each of said free swinging weights is mounted on said exciter shaft between a respective end of said fixed weight and an adjacent component of said exciter assembly so as to be restrained from substantial axial movement along said exciter shaft without the use of any retaining structure that is fixed to said free swinging weight.

16. The vibratory roller as recited in claim 15, wherein said first free swinging weight is sandwiched between said fixed weight and one of said bearings and said second free swinging weight is sandwiched between said fixed weight and a torque transfer element affixed to said exciter shaft.

Sub A4

21. The method as recited in claim 20, wherein the step of axially restraining said first and second free swinging weights comprises sandwiching said first free swinging weight between said fixed weight and one of said bearings and sandwiching said second free swinging weight between said fixed weight and a torque transfer element.

22. The method as recited in claim 21, wherein said exciter shaft is a first exciter shaft, said fixed eccentric weight is a first fixed weight, and said torque transfer element is a first torque transfer element, and further comprising:

fixing a second torque transfer element and at least two bearings to a second exciter shaft;

fixing a second eccentric weight to said second exciter shaft;

mounting third and fourth free swinging eccentric weights on said second exciter shaft adjacent respective ends of said second fixed weight so as to be rotatable a limited amount relative to said second exciter shaft;

restraining said third free swinging weight from substantial axial movement along said second exciter shaft solely by sandwiching said third free swinging weight between said second fixed weight and one of said bearings; and

restraining said fourth free swinging weight from substantial axial movement along said second exciter shaft solely by sandwiching said fourth free swinging weight between said second fixed weight and said second torque transfer element.

(4) restraining said first and second free swinging weights from substantial axial movement along said exciter shaft solely by sandwiching said first and second free swinging weights between respective ends of said fixed weight and operative components of said exciter assembly, each of said operative components comprising one of a bearing and a torque transfer element; then

(B) inserting said exciter assembly axially into an opening in a exciter housing and mounting said exciter assembly in said exciter housing;

(C) mounting said exciter assembly on a trench roller in operative communication with a rotatable drum assembly that supports said trench roller on a surface to be compacted.

28. The method as recited in claim 27, wherein the step of axially restraining said first and second free swinging weights comprises sandwiching said first free swinging weight between said fixed weight and one of said bearings and sandwiching said second free swinging weight between said fixed weight and a torque transfer element, and wherein said exciter shaft is a first exciter shaft, said fixed eccentric weight is a first fixed weight, and said torque transfer element is a first torque transfer element, and further comprising:

fixing a second torque transfer element and at least two bearings to a second exciter shaft,

fixing a second eccentric weight to said second exciter shaft,

mounting third and fourth free swinging eccentric weights on said second exciter shaft adjacent respective ends of said second fixed weight so as to be rotatable a limited amount relative to said second exciter shaft,